

Performance Optimisation

Understanding Heat Pump Efficiency

Heat pump efficiency is expressed as CoP (Coefficient of Performance):

- $\text{CoP} = \text{Heat Output} \div \text{Electrical Input}$

A CoP of 3 means: 1 kWh of electricity = 3 kWh of heat delivered to the home

The efficiency of a heat pump changes constantly throughout the day. To optimise performance, it helps to understand the four factors that influence efficiency the most.

The following pages explain how to identify inefficiencies using live data, and how to optimise settings safely to achieve stable, efficient operation.

Factors Affecting Efficiency:

1. Flow Temperature

- Flow temperature is the temperature of the water leaving the heat pump towards radiators or underfloor heating.
- Lower flow temperature = higher efficiency
- Every 1°C reduction in flow temperature can increase efficiency by roughly 2–4%, depending on operating conditions.

2. Cycling

- A heat pump is most efficient when running continuously at low power.
- Short, frequent cycles:
 - waste energy during start-up
 - increase wear
 - reduce CoP by 10–25%
 - create unstable indoor temperatures
- Long, steady cycles give the best efficiency.

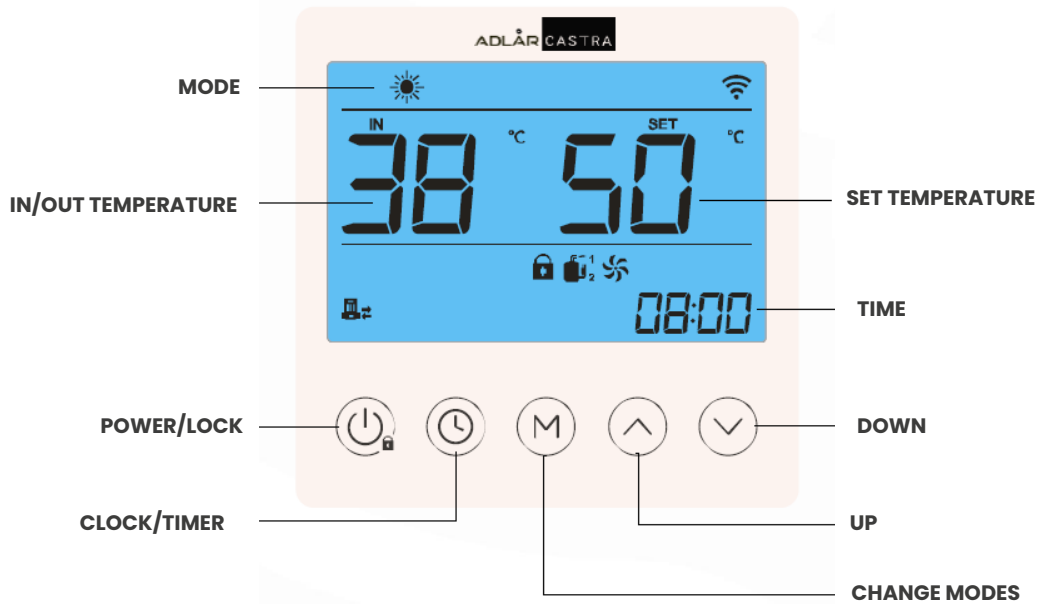
3. Weather Compensation

- A heat pump increases water temperature when it gets cold outside and lowers it when it warms up.
- A well-set curve gives you:
 - stable room temperature
 - minimal cycling
 - optimal efficiency
 - no need for manual adjustment



SCAN THE QR CODE OR VISIT OUR WEBSITE
FOR MANUALS AND HELPFUL CONTENT **ADLAR.**
CO.UK/INFORMATION

Flow Temperature

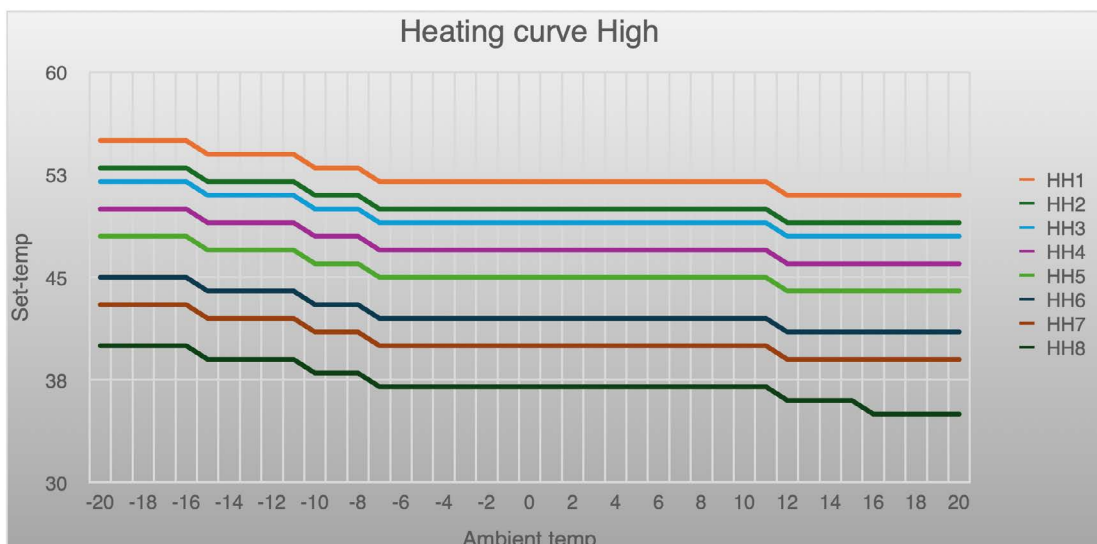


How does heat pump control work?

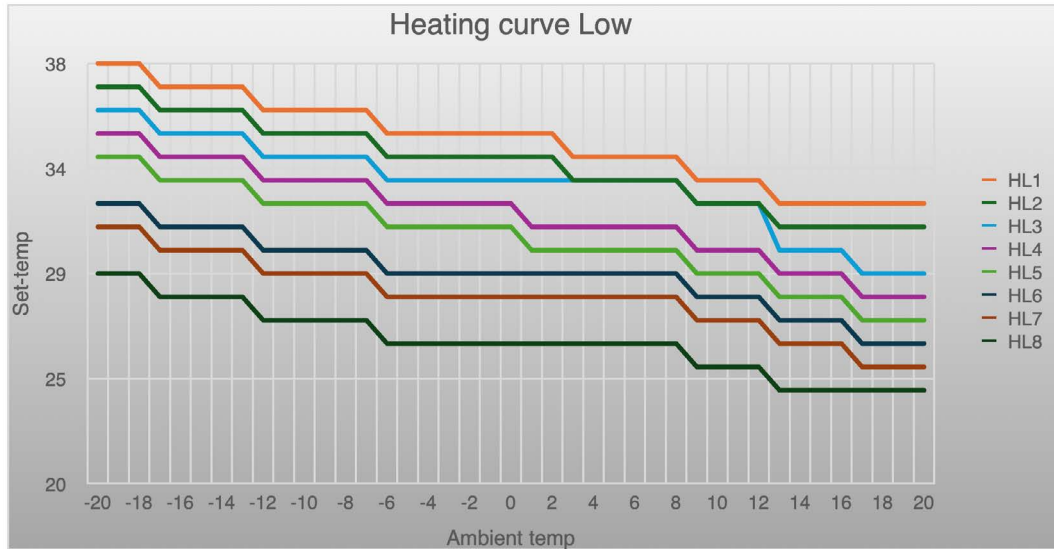
The Aurora II heat pump heats on the basis of a heating curve. A heating curve is a curve that determines the temperature of the water that enters the house based on the outside temperature. This is the water that flows through the radiators or the underfloor heating. The warmer this water is, the warmer it becomes in the house.

Below you can see the heating curve that can be set in the Aurora II. There are two types of heating curves available for heating the house. High water temperature heating lines (HH1-HH8) and low temperature heating lines (HL1-HL8). In general, most houses can get by with a low temperature heating curve. If you have good insulation and efficient underfloor heating, you will quickly get warm with HL8 to HL4. If you have radiators with radiator fans, you will get by with HL4. If you have old radiators without fans, it is HL1 or a heating curve in the high temperature range (HH8-HH6).

The horizontal axis (x-axis) indicates the ambient temperature (outside temperature), the vertical axis (y-axis) indicates the water temperature that the heat pump produces and enters the house.



Efficiency: Flow Temperature



Every 1°C reduction in temperature increases efficiency by roughly 3–4%.

Whilst you don't want to be cold, operating a heat pump most efficiently does require a bit of a rethink in heating. The idea behind heat pump efficiency is to provide a low background heat not fireplace-level bursts of heat, but steady background warmth.

How to change your temperature settings?

Review [this link](#) or scan the QR code to see how to change heat curves and temperature settings.

- Change heat curves one at a time waiting 24-48hrs to see the impact.
- If the house remains warm, reduce again.
- Try to optimise your home so that your home isn't too hot, but rather has a base level of comfort.



Temperature Valves on the Display:

- The displayed water temperature on the left in the display in combination with the text "IN" (top left of the displayed water temperature) is the current measured water temperature that is returned from the home. This is measured at the incoming side of the heat pump.
- The displayed water temperature on the right in the display in combination with the text "OUT" (top right of the displayed water temperature) is the current measured water temperature that is supplied to the home. This is measured at the outgoing side of the heat pump.
- The displayed temperature on the right in the display is the set water temperature that the heat pump will heat to.

CYCLING



A heat pump works best when it runs steadily, like a car cruising on a motorway. If it has to keep stopping and starting, it wastes energy every time it restarts. So we set it up to run gently and continuously instead.

In the same way variable speed limits on motorways work to prevent traffic coming to a complete standstill, if a heat pump produces heat faster than the house can absorb it, it has no choice but to turn itself off. By running the compressor and fan a little slower, the heat pump can match the home's heat loss and keep running smoothly without stopping and starting.

Performance Checks for Cycling

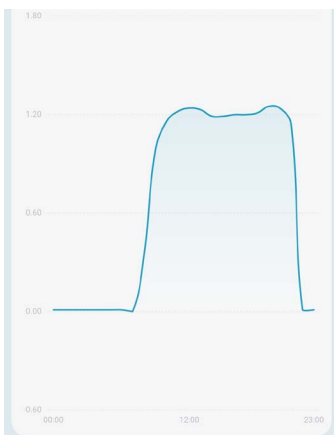
Your heat pump settings are customised at the point of installation to provide optimum heating for your home. There are some assumptions made in the build up to your installation and other factors, such as your heating system which go into the parameter settings set.

There is therefore scope for error and potential for further optimisations based on heat pump performance. The table below gives an overview of performance factors which might suggest some optimisations are needed.

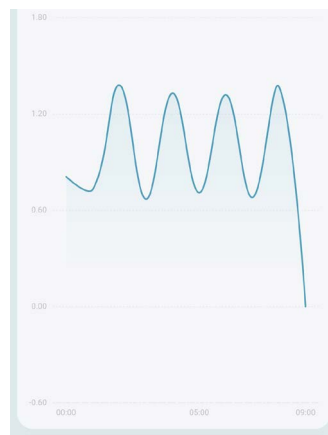
Symptom	Meaning	How to observe:
Sharp rising/falling spikes in electric usage	Cycling	Check your Energy Usage chart
Short run cycles	Overshooting flow temp	Heat pump running less than 20mins at a time
More than 20 starts/day	Excessive restart	+15 ON/OFF per day
Flow temperature overshoot	DeltaT too low	Flow temp. rises above set temp.
Irregular usage graph	Bad modulation	Spikes in energy usage
High minimum electrical input	Compressor never reaches low frequency	Live data monitoring

Energy Consumption Spikes:

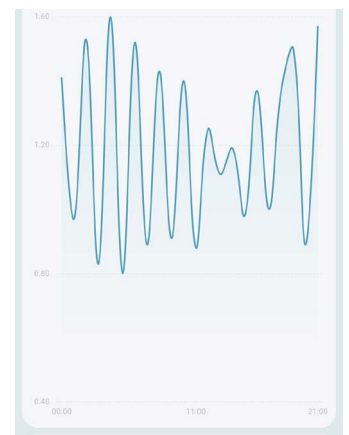
One key observation is your energy consumption chart on the APP which indicates cycling and heat pump behaviour.



- Stable operation
- Customer turns heat pump off overnight, which isn't recommended.

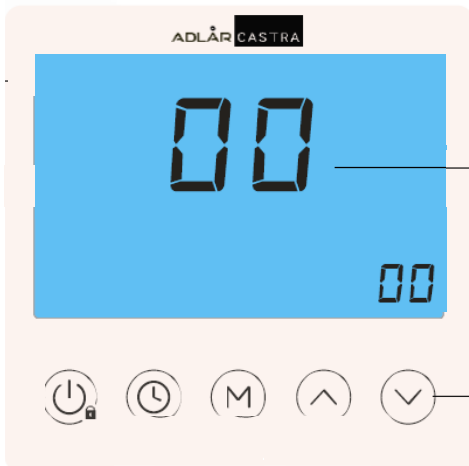


- Low modulation over the day.
- 5 cycles over 21hrs.
- Good performance



- +10 cycles per day
- Large peaks and troughs on operation.
- Bad operation.

LIVE DATA CHECKS



LIVE DATA NUMBER

DATA READ OUT

PRESS & HOLD DOWN BUTTON



- Press and hold the down button for +5 seconds when display is unlocked or enter into "Query" on your APP
- Press the DOWN or UP arrows to move through the live data to make the following recordings

Live Data	APP Query Readout
01	Compressor Frequency
02	Fan Motor Frequency
03	EEV Open
04	EVI Open
09	High pressure temp
10	Low pressure temp
11	Ambient Temp
12	Coiler Temp
14	Suction temp
15	Discharge temp
16	Inlet temp.
17	Outlet temp.
25	Water flow
Set Temperature	Set temperature

- Take readings
- Repeat to take readings every 10 minutes
- Repeat at least 3 times

DIAGNOSTICS

WHAT TO LOOK AT:

This section helps you identify why your heat pump may not be operating optimally, using the live data and energy usage information described earlier. The aim is to identify the type of behaviour being observed so the correct optimisation approach can be applied.

WHAT GOOD OPERATION LOOKS LIKE:

Before diagnosing problems, it helps to understand what normal looks like. A well-optimised heat pump will typically show:

- Long, steady run periods
- Smooth electrical power usage
- Minimal compressor start/stop events
- Stable flow and return temperatures
- A ΔT (flow – return) generally between 2–5°C
- Fewer than 10–15 compressor starts per day
- A stable indoor temperature with no noticeable swings
- If your system broadly matches this behaviour, no further optimisation may be required.

STEP 1: Check for Cycling

Cycling means the compressor is repeatedly stopping and starting. Signs of cycling:

- Sharp peaks and drops in electrical power
- Compressor run times shorter than 30–45 minutes
- More than 20 compressor starts per day
- Flow temperature repeatedly hitting setpoint and dropping again

Why this matters

Cycling is one of the biggest causes of poor efficiency. Every restart wastes energy and prevents the compressor from operating in its most efficient range. If cycling is present, proceed to Step 2.

STEP 2: Check the Temperature Difference (ΔT)

ΔT is the difference between flow temperature and return temperature. Use live data:

- Outlet temperature
- Inlet temperature

ΔT Observed	Like Meaning
>6–7°C	Flow may be too low (flow-limited system)
2–5°C	Generally healthy range
<2°C	Over-pumping or overly aggressive control

ΔT is one of the most important indicators of whether cycling is caused by flow issues or control behaviour.

ISSUE IDENTIFICATION:



A) Flow-Limited Behaviour

Typical signs

- ΔT consistently above 6–7°C
- Flow temperature rises very quickly
- Heat pump reaches limits or shuts down early
- Heat pump struggles to deliver heat smoothly

Likely causes

- Insufficient water circulation
- Pump speed too low
- High system resistance
- Closed valves / restricted pipework

Typical improvements

- Increase minimum circulation pump speed
- Increase pump speed at setpoint
- Ensure adequate flow remains when heating demand is low
- Review system hydraulics if flow remains limited

B) Control / Overshoot Behaviour

Typical signs

- ΔT is reasonable (2–5°C)
- Flow temperature overshoots setpoint
- Heat pump shuts down shortly after reaching target
- “Sawtooth” or jagged power usage pattern

Likely causes

- Heating curve too high
- Control system reacting too aggressively
- Pump behaviour causing temperature overshoot
- Small temperature changes triggering stop/start

Typical improvements

- Reduce heating curve slightly
- Increase temperature dead-band (ΔT settings)
- Apply smoothing parameters to slow system response
- Avoid overly aggressive pump behaviour near setpoint

C) Low Load / Mild Weather

Typical signs

- Cycling mainly in mild weather
- House heats easily but heat pump still cycles
- Low heat demand compared to heat pump capacity

Likely causes

- Heat demand lower than minimum heat pump output
- Zoned systems with many closed circuits
- Setpoints too high for conditions

Typical improvements

- Keep at least one heating circuit fully open
- Reduce heating curve during mild weather
- Allow continuous circulation where possible
- Avoid turning the heat pump fully off overnight
- Set a custom heat curve up to match your needs.

Next Step:

Once cycling is confirmed, the next step is to determine whether the cause is related to flow, control behaviour, or low heat demand.

Custom Heat Curves:



PARAMETER OPTIMISATION

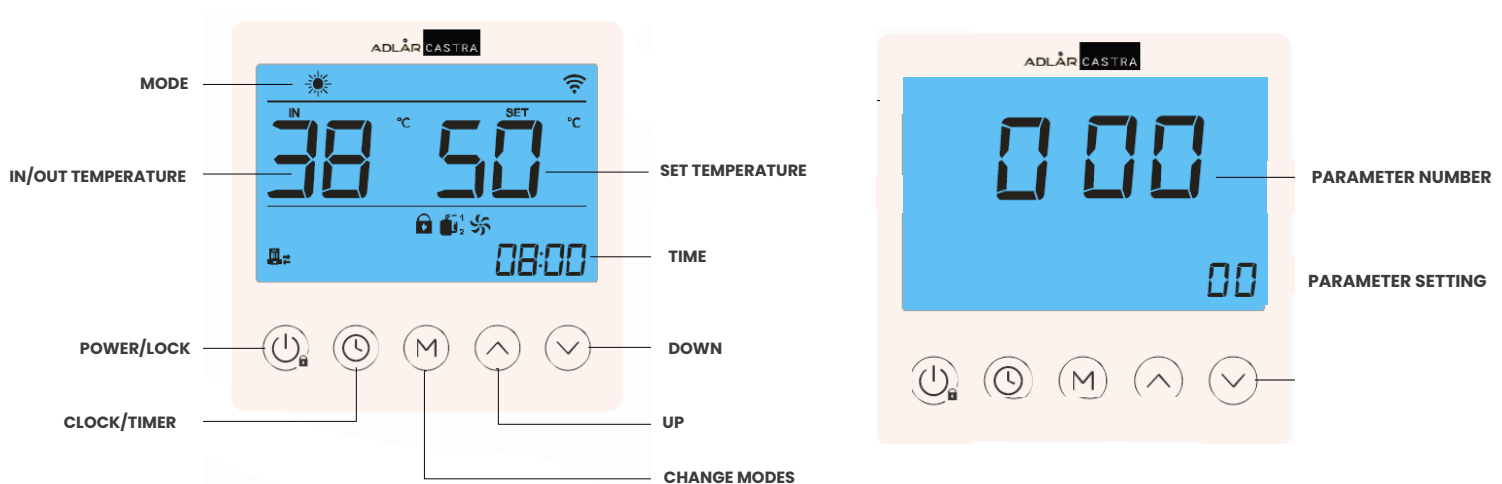
Disclaimer Warning!

Changing heat pump parameters has serious impacts on the way your heat pump can operate. Changing parameters without consultation is not advised. Adlår cannot be held responsible for changes to parameters made by customers.

Parameters should only be changed in small increments to ensure major changes don't occur.

YouTube Guide to Changing Parameters

- Review our Youtube video on how to change parameter settings following [this link](#) or scanning the QR code.
- Review the following parameters and send them to Adlår operations for review.



Description of Setting Change:

1. Unlock the display
2. Press and hold M button for +5 seconds (L 00 appears)
3. Press and hold M button again for +5 seconds (PA 55) (bottom will read 00)
4. Press down twice (number change to 998)
5. Press M once
6. P00 will appear
7. Use arrows to navigate
8. Press M to change parameter
9. Press M to confirm parameter
10. Press "POWER" button at any time to return to main screen or let the screen reset automatically.



ECO MODE

ECO Mode:

In ECO mode the compressor and fan frequency are significantly reduced. This can lead to a higher CoP. It does however limit your heat pumps ability to heat your home. When we run your home assessment we try to do an accurate heat loss calculation to correctly size your heat pump. This can mean that ECO mode reduces the heating too much to actually be able to keep up with the heat loss of the home.

Going into ECO Mode ECO Mode:

To enter into ECO mode, follow these instructions:

- Either in the APP, or by pressing the “Up” and “Down” arrows together at the same time for +3 seconds.
- The symbol of the moon and stars indicates “Eco” mode.
- Eco mode will heat slower, over a longer period of time. This optimises the low and slow principles of heat pumps.



Monitor

If the home isn't adequately heating up in ECO mode, this means the reduction in compressor and fan frequency is too high. Equally, if cycling is still occurring and the house is still heating up well then ECO settings may want to be adjusted further.

Parameter Changes ECO Mode:

Symptom	Parameter	Change per observation
ECO Mode underheating but heat pump is cycling in STANDARD Mode.	P88	+5
	P89	+5
ECO Mode overheating and heat pump is cycling a lot	P88	-2
	P89	-2

ECO MODE DISCLAIMER:

ECO mode is not a default efficiency setting.

It should only be used if the heat pump can still meet the home's heat loss without cycling.



FLOW RATE / DELTA T >6–7°C

FLOW RATE EFFICIENCY

By moving more water through the system, the heat pump can get rid of heat more easily. That stops the water temperature rising too fast, so the heat pump doesn't keep switching itself off and on. Running for longer at a steady pace is both more efficient and better for the system.

INCREASING FLOW RATE:

- Slows flow-temperature rise
- Reduces ΔT spikes
- Prevents overshoot
- Avoids stop-start cycling
- Keeps the compressor in its efficient range
- Improves overall CoP

Monitor

Check the live data number 25 or "Water Flow" in the APP. Target l/min should be ≥ 10 . Upon making the changes to parameters, please report back to Adlår Operations what changes you have made and what the final settings are to check and ensure the system operation isn't set too high.

If the pump is operating at the highest speed constantly, it may be more optimal to add a secondary pump or increase pipework sizes to increase flow rates.

Parameter Changes Flow Rate:

Parameter	Number	Change per observation	Default
Maximum circulation pump speed	P260	+10	60
	P260	+10	60
Inlet / Outlet Regulation	P116	Set to 0	0
Maximum DeltaT Inlet/Outlet	P23	Set to 5	12
DeltaT for circulation pump modulation	P99	Set to 5	5
Minimum circulation pump speed	P100	+10	65
	P100	+10	65
Circulation pump flow setting	P146	+10	35 (70 - 14kW)
	P146	+10	35 (70 - 14kW)
Maximum circulation pump speed	P260	Set to 99	60
Circulation pump speed when setpoint	P261	+10	50
	P261	+10	50

Increasing the circulation pump speed / flow rate can result in noise complaints in the pipework. It is advisable to do this step by step.

Always ensure sufficient flow when setpoint is reached (P261). If this is too low, the measurement of the water from the system will be too slow and it may take too long for the heat pump to switch on again.

A black outdoor unit with a slatted front panel and the ADLÅR logo on top, mounted against a wooden wall.

CYCLING PARAMETERS (ADVANCED)

SMOOTHING

This set of changes is not simply “increase flow”. Instead, it is aiming to slow the system’s reactions, smooth temperature changes, and stop the pump and heat pump over-responding to small ΔT changes.

In other words:

- Less aggressive pump modulation
- Less chasing of temperature noise
- More stable hydraulic conditions
- Fewer rapid compressor shut-downs
-

This is a valid anti-cycling strategy, but it works differently from “crank the pump speed up”.

WHEN IT WORKS

This configuration is most effective when:

- The system already has adequate flow
- Cycling is caused by control overshoot, not low flow
- Flow temperature rises too quickly near setpoint
- The system shows “sawtooth” compressor behaviour

If ΔT is already very high ($>6-7^{\circ}\text{C}$), this approach alone may not be enough.

PARAMETER CHANGES

Parameter	Number	Change per observation	Default
DeltaT for circulation pump modulation	P99	Set to 3	5
Minimum circulation pump speed	P260	-5	65
Circulation pump speed when setpoint	P261	-5	50
Delta set temp and output/input at which pump turns on (cooling + heating)	P26	+1	5